common, the failure occurring either directly after synapsis, the chromatin thread not being segmented into chromosomes, or after tetrad formation, the spores aborting. The microsporangiate archesporium consists of a hypodermal plate of cells (two cells in transverse section and six in longitudinal). In connection with the reduction division, 20 chromosomes were counted as the gametophyte number; and this was checked up by an approximate count of 40 in certain nuclear divisions of the embryo. The solitary megaspore mother cell is differentiated beneath a heavy development of nucellar tissue (about 12 layers). One of the surprising results is that the functioning megaspore of the linear tetrad is the micropylar one. The antipodal cells are evanescent, and the fusion of the polar nuclei is somewhat tardy. Double fertilization was observed very distinctly. In the development of the embryo no suspensor was discovered, and before the segmentation of the fertilized egg about 100 free, parietally placed, endosperm nuclei have appeared. Later there is endosperm wall-formation, and in the later stages of the embryo it is imbedded in a delicate endosperm tissue. Perhaps the most interesting data are those in reference to the time-relations of these events, the rate of development being unusually high. Flowers hand-pollinated at 10:00 A. M. showed fertilized eggs in the afternoon of the following day. The interval between megaspore-formation and the completed sac (fertilization stage) is three days. About 60 hours after fertilization ($3\frac{1}{2}$ days after pollination) the egg segments, and in about a week after pollination the embryo consists of "hundreds of cells."—J. M. C.

Pteridosperms and angiosperms.—OLIVER has published the substance of a lecture delivered before the Botanical Club of Cambridge University[27] and illustrated it by a scheme of the occurrence of vascular plants in geological time, modified from E. W. BERRY. It discusses the bearing of recent investigations of the pteridosperms and cycads on the origin of seed-plants. Attention is called to the fact that the appearance of the Cycadophyta is geologically synchronous with the disappearance of the pteridosperms, and that the former perpetuate in many respects, especially in the cycadeoidean forms recently described by WIELAND, the fern-like characters of the latter. Just as the incoming of the Cycadophyta marks the end of the reign of the pteridospermic gymnosperms, so the appearance of the angiosperms in the Cretaceous and Tertiary marks the waning of the Cycadophyta. The author calls attention to the angiospermoid protection of the exalbuminous seeds of Cycadeoidea by the sterile scales of the inflorescence. He further emphasizes the resemblance of the bisporangiate inflorescence with its perianth-like envelops in Cycadeoidea with the typical angiospermous flower, since the parts occur in the same order, namely, perianth, microsporophylls, and, uppermost of all, the megasporophylls. He suggests that possibly the Cycadophyta may be appropriately divided into two series, the Gymnocycads and the Angiocycads, the former the ancestors of the living cycads and the latter consti-

[27] OLIVER, F. W., Pteridosperms and angiosperms. New Phytologist 5:232–242. 1906.

tuting the Bennettitales. The latter or some allied stock he regards as the possible ancestors of the angiosperms, a probability which he considers strengthened by the incoming of the angiosperms as they became extinct.—E. C. JEFFREY.

Stem-thickening in monocotyledons.—It has been claimed that in palms secondary thickening by means of a merismatic zone occurs, as in Dracaena. STRASBURGER[28] has investigated the subject by a study of two stems of *Washingtonia filifera*, and finds no cambial zone, but instead a number of localized areas in the pericycle where fundamental tissue, bundles, and sclerenchyma are produced. An examination of stems of *Pandanus utilis* afforded similar results. Among the numerous details recorded is the observation concerning the arrangement of the leaves in Pandanus; following SCHWENDENER the author finds that this is due to torsion of the stem axis.

Another paper on Pandanaceae, by CARANO,[29] denies the existence of secondary growth in this family. Among other observations of interest is the crushing of vessels of the xylem at the leaf bases by growth of the wood parenchyma; this process seems to aid in casting off the old leaves. The bundles of the blade of the leaf show a horseshoe-shaped mass of phloem surrounding the xylem, and water-storage tissue is abundant along the median nerve. The root shows a number of large medullary bundles in addition to the peripheral ones, and to the former the lateral roots are attached. The roots springing from the stem are likewise connected with deeply situated vascular strands. These features hardly support the claim that this family is a primitive one.

In the palm *Euterpe oleracea*[30] the stem increases in thickness by the extraordinary growth of the mechanical tissue lying external to the phloem. This growth takes place after the stem has become hard and woody.—M. A. CHRYSLER.

Germination of dimorphic fruits.—ERNST[31] has investigated the germinative characters of the dimorphic fruits of *Synedrella nodiflora*, a composite of the East Indian Archipelago. He finds that the fruits produced by the pistillate-ray flowers differ radically in form from those produced by the perfect disk flowers. Corresponding to these differences in structure, he finds differences in germinative characters. The disk fruits germinate both in light and in darkness to a higher per cent. and more quickly than do the ray fruits. In the disk fruits diminution in the intensity of the light or its complete withdrawal only retards slightly the first stages in the germination, although it defers considerably the

[28] STRASBURGER, E., Ueber die Verdickungsweise der Stämme von Palmen und Schraubenbäumen. Jahrb. Wiss. Bot. **43**:580–628. *pls. 3–5.* 1906.

[29] CARANO E., Ricerche sulla morfologia delle Pandanacee. Annali di Botan. **5**:1–46. *pls. 1–5.* 1906.

[30] KRÄNZLIN, H., Ueber das Dickenwachstum der Palme *Euterpe oleracea.* Ber. Deutsch. Bot. Gesells. **24**:483–489. 1906.

[31] ERNST, A., Das Keimen der dimorphen Früchten von *Synedrella nodiflora.* Ber. Deutsch. Bot. Gesells. **24**:450–458. 1906.